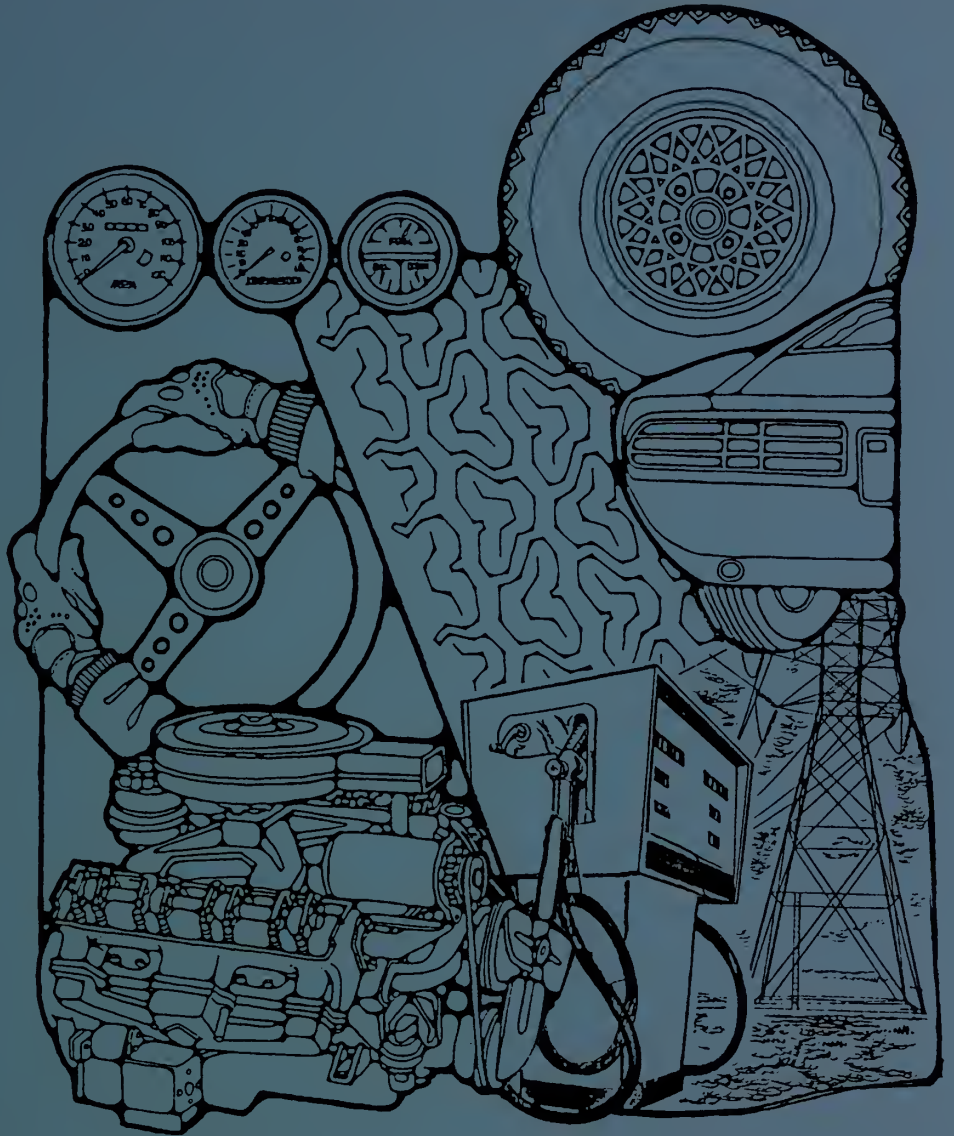


INDUSTRIAL EDUCATION 10-20-30

POWER



INDUSTRIAL EDUCATION

Curriculum

Alberta
EDUCATION

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INDUSTRIAL EDUCATION 10, 20, 30

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NOTE: This Curriculum Guide is a service publication only. The Senior High School Program of Studies contains the official statement concerning Senior High School courses. The information contained in the guide is prescriptive insofar as it duplicates that contained in the Program of Studies. There are in the Guide, however, as well as content, methods of developing the concepts, suggestions for the use of teaching aids and lists of additional reference books.

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NOTE:

Industrial Education 10, 20 and 30 is made up in four (4) packages according to career fields.

Teachers may select modules from a number of fields and consequently will need those packages that contain the content for the modules they plan to teach.

The packages are color-coded and contain the following career fields:

Electricity-Electronics	-	yellow
Materials	-	green
Power Technology	-	blue
Visual Communications	-	orange

The general modules of Research, Development and Production Science will be found in each package.

Study the content of the modules carefully and select those that best meet the needs of the students in the school, your own competencies and the availability of tools and equipment.

INTRODUCTION

The Industrial Education 10, 20, 30 series of courses is designed to provide exploration of, and orientation to, a wide variety of career options. These courses provide guidance to students to help them select more in-depth courses for occupational preparation or simply add to their technological "know-how".

Through the program, students are able to work in an environment which is conducive to challenging their intellect and developing their talents in a number of technical and craft areas. Students become aware of the interrelationship and the dependency of one technology upon the others. They have the opportunity to develop an understanding of the principles and skills required in the various occupations. Students will have many opportunities to apply academic skills learned in other subjects to their lab work.

RATIONALE

Industrial Education adds a new dimension to the program for educating young people at the secondary school level. For many students it will provide unique options to help prepare them for the life ahead while enjoying their current studies. The authors of the Industrial Education curriculum recognize that the needs of society have changed, and with them the approach to knowledge acquirement. Students today must be helped to discover how to learn, to conduct inquiry, to study independently, to make choices and decisions, to use technology, and to live with change.

The Industrial Education program is concerned with career development. Because careers today do not develop along predictable lines, our education program must provide considerable flexibility so that students have an option of several career choices. This is possible for several reasons. A person who has been broadly educated is able to learn what he needs to know, within limitations, about a new job. With the general education level of the society rising, the future worker needs broad as well as experience-based education. Such an education offers him/her subsequent chances for rapid and successful specialization. With this in mind the learning experiences should be such that they become the basis upon which specialization can be built.

Our task in the secondary school then, is to provide students not only with entry skills for several careers but to orient the program to meet social and cultural goals. This means that the various courses or disciplines must be interrelated. Industrial Education provides a unique opportunity for the teacher to demonstrate these relationships and further, to capitalize on them by means of the motivation created through practical applications. Thus the experiences to which students are exposed should provide them with realistic criteria for career guidance.

Industrial Education is a program consisting of courses that provide a continuum of experiences, starting with exploratory experiences and activities in the elementary and junior high school, expanding in the high school to the development of skills in career fields and culminating in on-the-job experience.

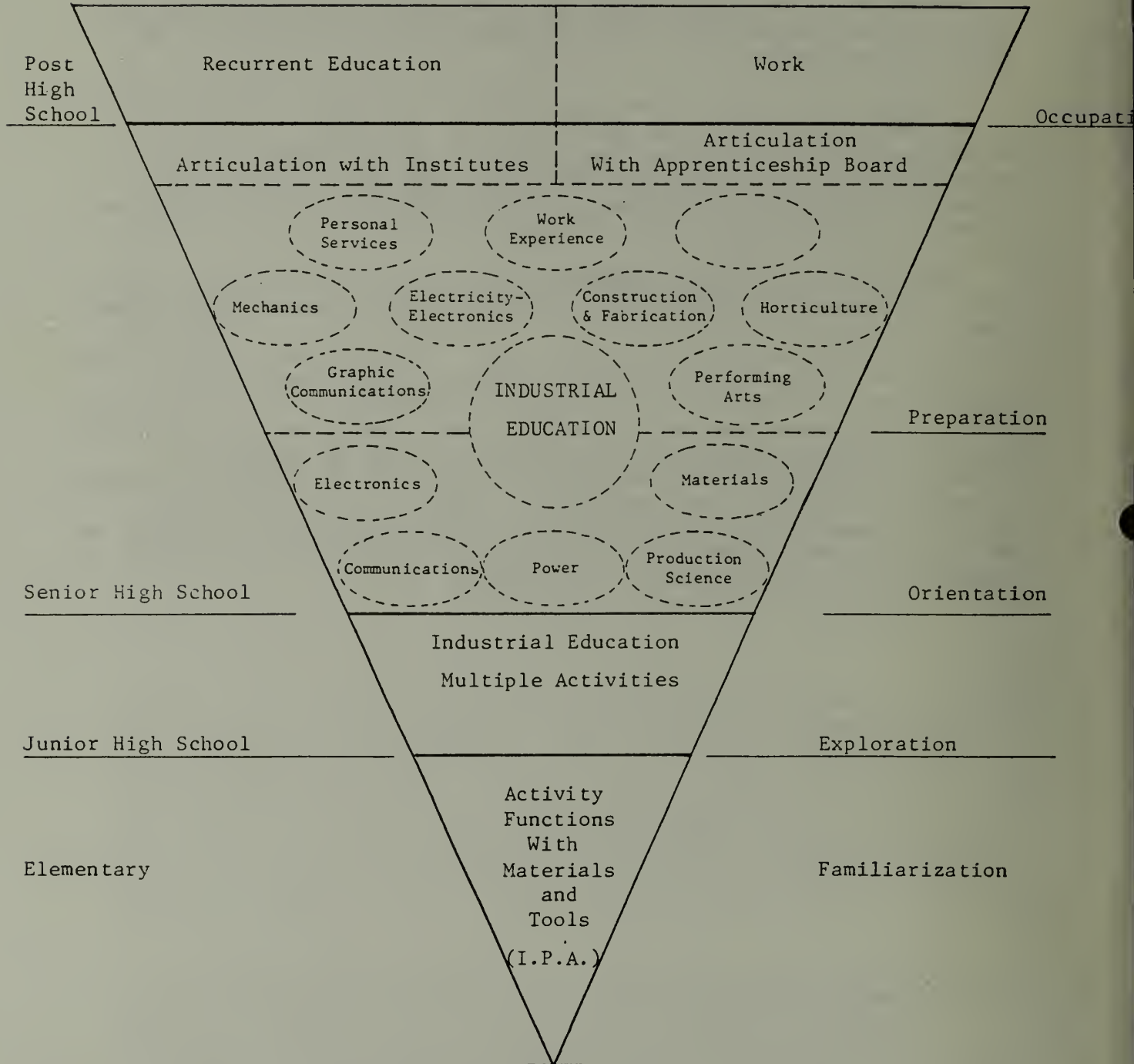
Industrial Education in the Junior High School, the exploratory phase of the continuum, provides the opportunity for the students to explore, reason, experiment and discover the reality of the technological society in which they live. The content of the program deals with industry, its organization, materials, processes, products, occupations, and the problems resulting from the impact of technology on society.

Following the exploratory phase, students may begin orientation studies in a career field. They may select modules of a more general nature in the Industrial Education 10, 20, 30 series or alternately take an introductory 12 course related directly to a career field. From here they advance to the more specific courses in the Industrial Education 22-32 program which prepare them for a career. The chart on the following page illustrates the Industrial Education Program in conceptual form, showing the advancement of a student from the awareness or familiarization stage to exploration, orientation, preparation and finally, an occupation. These courses provide in-depth experiences in the development of skills in tool and machine operation, material processes, drawing and interpretation and a knowledge of the basic concepts related to the technologies. All the courses place emphasis on practical work and applied theory.

ALBERTA INDUSTRIAL EDUCATION PROGRAM

FOR

CAREER CHOICE AND DEVELOPMENT



Legend: ————— Solid line indicates levels
 - - - - - Broken lines and open spaces indicate opportunity to transfer to other options

OBJECTIVES OF INDUSTRIAL EDUCATION

The Industrial Education Program can help achieve the Goals of Schooling and Education. The course objectives are more focused and give direction to the teacher.

The objectives of Industrial Education are classified in three areas with the following purposes:

Personal Growth:

To provide opportunities for the individual growth of the student through the development of acceptable personal and social values necessary in a productive society.

1. To provide a technical environment which motivates and stimulates individuals to discover their interests and develop personal and social responsibilities.
2. To assist in the development of positive attitudes toward safety.
3. To assist in the development of positive attitudes toward conservation and environment.
4. To assist in the development of consumer literacy.

Career Exploration:

To develop basic competencies, integrating cognitive and psychomotor skills to enter a family of occupations or post-secondary institutions for further education.

1. To provide exploratory experiences in the use of tools, equipment and materials appropriate to various technologies prevalent in a productive society.
2. To develop an understanding of the interrelationship of various technologies.
3. To provide a technical environment for students to synthesize their accumulated knowledge in the solution of practical problems.
4. To assist the student to develop habits that will be conducive to the establishment of a safe environment.

Occupational Skills:

To develop basic competencies, integrating cognitive and psychomotor skills to enter a family of occupations or post-secondary institutions for further education.

1. To provide safe exploratory experiences in the use of tools, energy, equipment and materials appropriate to various technologies prevalent in a productive society.
2. To develop an understanding of the intrrelationships of various technologies.
3. To provide a technical environment which permits students to synthesize their accumulated knowledge in the solution of practical problems, and to assist students to develop habits that will be conducive to the establishment of a safe environment.

ORGANIZATION

Program Organization:

The Industrial Education 10, 20, 30 courses consist of 56 modules of content. The modules are categorized into career fields. Four career fields, i.e. Graphic Communications, Electricity- Electronics, Materials, and Power Technology have the content of the modules outlined in this guide.

1. Regular Program

Courses may be created by arranging combinations of modules drawn from the fifty-six available modules. These should be selected carefully to meet the needs of the students while at the same time providing appropriate consideration to factors such as suitability of facilities, equipment availability, supply costs and teacher experience or training. Each course may be taught for 4 or 5 credits (100 - 125 hours). The content for each module may range from 25 - 33 hours. Four modules of 33 hours each would provide the necessary time for a five-credit course. Four 25-hour modules would meet the time requirements for a four-credit course. The selection and sequence of modules is left to the teacher's discretion.

Procedurally, students will register in a course made up of four modules. The first four modules taken by a student would normally be registered as Industrial Education 10A. The next four modules would become 20A and the third set of four modules would be 30A. If some students wished to enrol in further Industrial Education courses, the next course would become 10B, with 20B and 30B following. It would be possible for students to arrange different sequences of courses if it is thought advisable. For example, one sequence might be 10A, 10B, 20A, 30A, 30B; another might be 10A, 20A, 30A, 10B, etc. Sequencing of courses will be left to local authorities. Examples of courses are as follows:

IE 10A (4-5 credits)	IE 20A (4-5 credits)	IE 30A (5 credits)
IE 10B (4-5 credits)	IE 30A (4-5 credits)	IE 30B (5 credits)

2. Special Consideration

In schools where vocational courses are taught, teachers have the option of using content from the "12" courses to make up the 65 hours required as prerequisite to the "22" courses. That is, in a composite high school where unit shops are available, students could be scheduled into two shops for a total of 125 hours, e.g. Auto and Welding. They could then advance to a "22" course in either or both of the courses.

Students in the Industrial Education 10 program would be required to take two modules for 33 hours each, directly related to the "22" course for which they are earning the prerequisite. For example, a student would have entry to a "22" program by taking two closely related modules, plus two others:

e.g. Basic Woods (33 hrs.)	65 hrs. permit entry to
Building Construction (33 hrs.)	Building Construction 22
Architectural Drawing (33 hrs.)	
Basic Wiring (33 hrs.)	
Approximate Total 132 hrs. = 1 Industrial Education course	
(5 credits).	

Facility Organization

The organization of the physical facilities is in part determined by the original plan. There are, however, adjustments that can be made in the layout by the teacher to accommodate his/her style of teaching. The number of students in the class affects the way the lab or shop is organized. While most of the shops in Alberta are designed for 16 to 20 students, a number of factors must be considered in the final assignment of class load. These factors include:

1. physical size of the shop or laboratory
2. type of student
3. amount of equipment
4. type of programming
5. type of course
6. training and experience of the teacher.

Safety of the student and the opportunity to obtain teacher contact are important considerations when class loads are determined.

EVALUATION

Evaluation of student growth should be based on stated behavioural changes and specific criteria understood by the students. Allowance should be made for both self and teacher evaluation and, in some cases, peer evaluation. Evaluation should be based on the three domains of learning as follows:

Affective
(Personal Growth)

Cognitive
(Subject matter)

Psychomotor
(Product)

MODULE TITLES

The following are the titles of modules in the Industrial Education 10, 20, 30 course.

Electricity-Electronics (yellow package)

1. Basic Electricity and Electronics I
2. Basic Electronics II
3. Equipment Servicing
4. Logic Circuits
5. Computing Systems
6. Introduction to Computers
7. Computer Programming - Introductory

8. Computer Programming - Industrial Applications
9. Communications - Introductory
10. Communications - Systems
11. Electronic Design
12. Electronic Construction

Materials (green package)

1. General Woods
2. Building Construction (Frame)
3. Building Construction (Sub-Trades)
4. Cabinet Construction (Basic)
5. Cabinet Construction (Advanced)
6. General Metals
7. Sheet Metal
8. Machine Metal
9. Arc Welding
10. Oxy-Acetylene Welding
11. Foundry
12. Earths
13. Plastics
14. Textiles
15. Foods

Power Technology (blue package)

1. Conventional Heat Engines
2. Small Engine Repair
3. Small Engine Tune-Up and Troubleshooting
4. Mechanical Systems
5. Non-conventional Power Sources
6. Electrical and Electronic Systems
7. Electro Mechanical and Electronic Control
8. Appliance Repair and Troubleshooting
9. Automobile Maintenance
10. Fluid Power
11. Automobile Tune-up
12. Automobile Repair
13. Automobile Ownership

Visual Communications (orange package)

1. Introduction to Offset Lithography
2. Process Photography - Line
3. Process Photography - Halftone
4. Layout and Design
5. Topographical and Architectural Drafting
6. Relief Printing
7. Screen Process Printing
8. Black and White Photography - Basic
9. Black and White Photography - Advanced
0. Color Photography
11. Mechanical Drafting
12. Customer Service
13. Offset Printing Production

General

Three modules of a general nature also are available. These modules may be used by a student or group only once. These are:

1. Research module
2. Developmental module
3. Production Science module

INTRODUCTION TO POWER TECHNOLOGY

With the concern for the efficient utilization of energy, the study of power technology takes on increased significance.

There are thirteen modules of content which provide the students and teacher considerable choice in building the type of program best suited to the situation. The modules listed may be taught in any order that the teacher finds most appealing.

The major concepts addressed in Power Technology are:

1. Energy conversion;
2. Energy transfer;
3. Energy utilization.

In addition, the nine concepts common to the total program are studied where appropriate in each module. These are:

1. Consumer Awareness
 - quality
 - affective advertising
 - specifications
 - dollar value
 - buying procedures
 - availability
 - parts
 - serving
2. Environmental Implications
 - time element (past, present, future)
 - rates of consumption
 - conservation
 - alternatives
 - pollution (land, air, water, noise)
3. Graphic Interpretation
 - schematic
 - symbols
 - drawing interpretation
 - visuals
 - technical drawing and interpretation

4. Measurement
 - British Engineering System (present English systems)
 - System Internationale (SI)
 - accuracy
 - tools and instruments
 - tolerances
 - precision
 - estimating
 - approximating
 - computations (including graphs, charts, interpolation)
5. Career Information
 - benefits
 - unionism
 - local opportunities
 - job mobility (vertical, horizontal, geographic)
 - future
 - retraining and upgrading
 - jobs vs. careers
6. Societal Implications
 - time (past, present, future)
 - economic
 - life patterns
 - status
 - values and mores
7. Technological Implications
 - costs, benefits, consequences (C.B.C.)
 - resource use and abuse
 - tool development and use
 - manufacturing
 - servicing
 - obsolescence
 - design process
 - planning
8. Safety
 - unsafe conditions
 - unsafe acts
9. Historical Perspective
 - the historical development of the discipline

The systems approach, beginning with the system and progressing through units, components and principles, is a useful method of developing an analytical approach to problem solving. This approach works particularly well for teaching power technology.

The modules as listed may be selected in any order or combined to make a cluster related to a career area. Two modules taught for 65 hours will serve as a prerequisite for the 22 level courses in Automotives, or Related Mechanics.

COURSE CONTENT

POWER TECHNOLOGY

OBJECTIVES

The objectives of the modules in Power Technology are:

1. To make the student aware of a number of ways to convert energy forms and to use various methods of transferring the converted energy to an intended use.
2. To give the student an opportunity to practice trouble shooting techniques utilizing analytical thinking.

CONTENT

Generalizations, concepts and sub-concepts are outlined on the following pages. Teachers are expected to develop additional objectives and activities to supplement the identified content and maintain relevancy.

LEARNING RESOURCES

*Crouse, W.H. Automotive Mechanics, McGraw-Hill Ryerson, 1980.

*Thiessen, F., Dales and Davis, Automotive Principles and Service, Prentice Hall of Canada, 1981

*Refers to prescribed resources.

MODULE ONE
CONVENTIONAL HEAT ENGINES

OBJECTIVES

The objective of the Conventional Heat Engines module is to:

1. Allow the student to compare several internal and external combustion engines to determine their relative efficiency with respect to energy conversion, transfer and utilization.

LEARNING RESOURCES

Crouse, W.H., Small Engine: Operation and Maintenance, McGraw-Hill Ryerson, 1975.

Bohn, R.C., MacDonald, A.J., Power Mechanics of Energy Control, McKnight Publishing Co. Ltd, 1970

Briggs & Stratton, Four Stroke Cycle, flip chart, # MS 4602-24
Briggs & Stratton Corp., Milwaukee.

Briggs & Stratton, General Theories of Operation, form # MS 3553-24,
Briggs & Stratton Corp., Milwaukee, Wisconsin, USA. 53201.

General Motors Corp., ABC's of Hand Tools, General Motors Corp.,
Detroit Mich. 1945.

Stahn, C.R., Automotive Construction & Operation, McGraw-Hill Ryerson,
1976.

Stephenson, G.E., Small Gasoline Engines, Delmar Publishers, 1964.

Thiessen, F. Dales, Davis, Automotive Principles and Service,
Prentice-Hall of Canada, 1981

Workmen's Compensation Board, Safety Creed, # 557, WCB of Alberta.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPHE

GENERALIZATION: A knowledge and practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	<p>The student will:</p> <ul style="list-style-type: none"> - operate safely tools and equipment such as: <ul style="list-style-type: none"> - hand tools - power tools - hoists - jacking devices and stands - compressed air and equipment - lifting equipment - fire extinguishers - other equipment 		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none"> - discuss the hazards associated with: <ul style="list-style-type: none"> - gasoline and oil - batteries - gases from running engines - use correct protective equipment and apparel at all times 		
3. Accident Report	<ul style="list-style-type: none"> - explain the purpose and use of accident report forms and report all accidents 		
4. Compensation	<ul style="list-style-type: none"> - explain the function of and benefits available under the Workers' Compensation Act 		
5. First Aid	<ul style="list-style-type: none"> - attend to all minor injuries and practise minor first aid 		
6. Safety Program	<ul style="list-style-type: none"> - participate in the prescribed safety program of the lab and/or school system 		

NOTES:

TOPIC 2: IDENTIFICATION AND USE OF TOOLS
AND EQUIPMENT

IEPHE

GENERALIZATION: In order to do the best possible job tools and equipment should be used to do the job for which they were designed.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Hand tools	<p>The student will:</p> <ul style="list-style-type: none">- identify and demonstrate the correct use of the following hand tools:<ul style="list-style-type: none">- hammers- wrenches- screw drivers- chisels and punches- reamers- taps and dies- drills- stud and bolt removers- other hand tools		
2. Power tools	<ul style="list-style-type: none">- identify and demonstrate the correct use of the following power tools:<ul style="list-style-type: none">- air operated tools- drill press- parts cleaning equipment- grinder- other equipment		
3. Measuring Instruments	<ul style="list-style-type: none">- identify and demonstrate the correct use of the following measuring tools:<ul style="list-style-type: none">- feeler gauges- steel scales or rulers- micrometers- dial indicators- telescoping gauges- other		
4. Care and Maintenance	<ul style="list-style-type: none">- maintain tools and equipment in safe operating condition at all times		

NOTES:

TOPIC 2: IDENTIFICATION AND USE OF TOOLS
AND EQUIPMENT (continued)

IEPHE

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
5. Special tools and equipment	<ul style="list-style-type: none">- store all tools and equipment in assigned locations, when not in use- identify and use for correct purpose special tools and equipment, such as:<ul style="list-style-type: none">- battery hydrometer- antifreeze tester- fan belt tension gauge- other		

TOPIC 3: COMBUSTION ENGINES

IEPHE

GENERALIZATION: Chemical energy is converted to mechanical energy through the action of the combustion engine.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Energy Forms</p> <p>2. Types of Combustion Engine:</p> <ul style="list-style-type: none">- external	<p>The student will:</p> <ul style="list-style-type: none">- differentiate between the following:<ul style="list-style-type: none">- potential energy- kinetic energy- chemical energy- mechanical energy- analyze the operating fundamentals of an external combustion engine, e.g., steam engine		

NOTES:

TOPIC 3: COMBUSTION ENGINES (continued)

IEPHE

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> - internal (gas and diesel) <p>3. By-Products of Combustion</p> <p>4. Basic Maintenance and Operation</p> <p>5. Testing</p>	<ul style="list-style-type: none"> - analyze the operating fundamentals of an internal combustion engine, e.g. two-stroke cycle engine four-stroke cycle engine - discuss the by-products of combustion, such as: <ul style="list-style-type: none"> - hydro carbons - carbon monoxide - nitrous oxide - inspect engines for proper lubrication and adequate fuel supply - service the air cleaner - start and operate an engine according to the operators manual instructions - given an operating engine and a dynamometer, chart the efficiency and horsepower: <ul style="list-style-type: none"> - under normal operating conditions - with a lean fuel/air mixture - with propane fuel (optional) - given a diesel and a gasoline engine, chart the torque and horsepower for each and compare the results 		

TOPIC 4: ALTERNATE ENERGY SOURCES

IEPHE

GENERALIZATION: Concern about the supply of oil has fueled the investigation of alternate energy sources.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Sources	<p>The student will:</p> <ul style="list-style-type: none">- identify the various energy sources such as:<ul style="list-style-type: none">- solar- wind- water- methane- propane- electrical- other		
2. Applications	<ul style="list-style-type: none">- discuss how the identified forms of energy may be harnessed and utilized in a vehicle to provide torque and horsepower- for each form of energy identified, discuss:<ul style="list-style-type: none">- efficiency- serviceability- reliability- operating costs		

NOTES:

MODULE TWO

SMALL ENGINE REPAIR

OBJECTIVES

The objectives of the Small Engine Repairs module are to:

1. Make the student aware of the physical requirements necessary for efficient energy conversion, energy transfer and energy utilization in a small engine.
2. Use tools correctly and follow standard procedures for overhauling a small engine.

LEARNING RESOURCES

Briggs & Stratton, Engine Parts Manual Microfiche, Briggs & Stratton Corp., Milwaukee, Wisc. 53201.
Briggs & Stratton, Engine Parts Master Price List, form # MS 7299 latest ed., Briggs & Stratton Corp.
Briggs & Stratton, Four Stroke Cycle, flip chart, # MS 4602-24, Briggs & Stratton Corp.
Briggs & Stratton, General Theories of Operation, form # MS 3553-24, Briggs & Stratton Corp.
Briggs & Stratton, Repair Instructions, form # MS 4750-101, Briggs & Stratton Corp.
Chilton, Repair & Tune-Up Guide for Small Engines, Chilton Book Co., 81 Curlew Drive, Don Mills, Ont., M3A 2R1.
General Motors Corp., ABC's of Hand Tools, GM Corp., Detroit Mich. 1945.
Intertec, Small Engines Service Manual, any ed., Intertec Publishing Corp., 1014 Wyandotte Street, Kansas City Missouri, 64101.
Tecumseh, Mechanics Manual, part number 692147, Tecumseh Products Co., Grafton Wisconsin, 53024, available from Lambert Electric Ltd., 114 Avenue A North, Saskatoon, Sask. S7L 6Y7.
Tecumseh, Master Parts Manual, Tecumseh Products Co., OR # 693029 Microfiche Master Parts Manual set and # 693634 Microfiche Early Production Parts, available from Lambert Electric.
Tecumseh, Tecumseh Parts Price List, form # 694549 latest edition microfiche, Tecumseh Products Company, 900 North Street, Grafton Wisconsin, 53024.
Workmen's Compensation Board, Safety Creed, #557, WCB of Alberta.

TOPIC 1: SAFETY

IEPSER

GENERALIZATION: A knowledge and practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	<p>The student will:</p> <ul style="list-style-type: none">- operate safely tools and equipment such as:<ul style="list-style-type: none">- hand tools- power tools- lifting devices and stands- compressed air equipment- fire extinguishers		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none">- discuss the hazards associated with:<ul style="list-style-type: none">- gasoline and oil- gases from running engines- use correct protective equipment and apparel at all times		
3. Accident Reports	<ul style="list-style-type: none">- explain the purpose and use of accident report forms and report all accidents		
4. Compensation	<ul style="list-style-type: none">- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	<ul style="list-style-type: none">- attend to all minor injuries and practise minor first aid		
6. Safety Program	<ul style="list-style-type: none">- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 2: TUNE-UP AND TROUBLE-SHOOTING

IEPSER

GENERALIZATION: An engine must be serviced and maintained in good condition to operate efficiently.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Systems:</p> <ul style="list-style-type: none">- fuel- exhaust- cooling- lubricating	<p>The student will:</p> <ul style="list-style-type: none">- discuss the fuel used in small engines, such as:<ul style="list-style-type: none">- gasoline- diesel- identify the parts of the fuel system and explain the operation of the main parts such as:<ul style="list-style-type: none">- fuel pump- carburetor- venturi- identify the exhaust system and discuss the effect of the muffler- discuss the need for a cooling system and identify different types, such as:<ul style="list-style-type: none">- air- water- identify the parts and discuss the operation of the lubrication system in the small engine- classify the oils used:<ul style="list-style-type: none">- viscosity- service rating		

NOTES:

TOPIC 2: TUNE-UP AND TROUBLE-SHOOTING (continued)

IEPSER

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none">- electrical	<ul style="list-style-type: none">- identify the parts of the electrical system and discuss the operation of:<ul style="list-style-type: none">- spark plug- ignition points and coil- condenser- magneto		
2. Diagnostic Tests	<ul style="list-style-type: none">- conduct the following checks and tests:<ul style="list-style-type: none">- check fuel flow- compression test- cylinder leakage test- check governor linkage adjustment- listen for bearing noises when operating- test magneto system for spark- test the magnets on the flywheel for adequate strength- test the ignition coil- test the condenser- check and test spark plug- check ignition points- test the electronic ignition pick-up coil		
3. Servicing and Tune-up	<ul style="list-style-type: none">- change engine oil- clean cooling fins- clean air filter or replace if necessary- check and clean fuel tank and fuel lines- clean fuel filter or replace if necessary		

NOTES:

TOPIC 2: TUNE-UP AND TROUBLE-SHOOTING (continued)

IEPSER

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none"> - adjust point gap or dwell - inspect, adjust, repair or replace the following as required: <ul style="list-style-type: none"> - float and needle - carburetor diaphragm - idle adjusting screw - choke - fuel pump - spark plug - ignition points 		
4. Manuals and Specifications	<ul style="list-style-type: none"> - use manufacturers' manuals to identify: <ul style="list-style-type: none"> - parts and numbers - specification for adjustments - torque for different fasteners - other information as required 		
5. Ordering Parts	<ul style="list-style-type: none"> - identify suppliers of required parts - use necessary order forms or other process to procure replacement parts 		
6. Costing	<ul style="list-style-type: none"> - make up estimates for various servicing and tune-up procedures - calculate actual cost for servicing and tune-up work 		

NOTES:

MODULE THREE

SMALL ENGINE TUNE-UP AND TROUBLE SHOOTING

OBJECTIVES

The objectives of the Small Engine Tune-up and Trouble Shooting module are to:

1. Allow the student to repair, adjust and control various small engines to achieve more efficient conversion, transfer and utilization of energy.
2. Provide the student with the procedures and practice to develop a logical system of procedures for analyzing and tuning a small engine.

LEARNING RESOURCES

- Crouse W.H., Small Engines: Operation and Maintenance
McGraw-Hill Ryerson.
- Briggs & Stratton, Engine Parts Manual Microfiche, Briggs & Stratton Corp., Milwaukee, Wisc. 53201.
- Briggs & Stratton, Engine Parts Master Price List, form # MS 7299 latest ed., Briggs & Stratton Corp.
- Briggs & Stratton, Four Stroke Cycle, flip chart, # MS 4602-24, Briggs & Stratton Corp.
- Briggs & Stratton, General Theories of Operation, form # MS 3553-24, Briggs & Stratton Corp.
- Briggs & Stratton, Repair Instructions, form # MS 4750-101, Briggs & Stratton Corp.
- Chilton, Repair & Tune-Up Guide for Small Engines, Chilton Book Co., 81 Curlew Drive, Don Mills, Ont., M3A 2R1.
- General Motors Corp., ABC's of Hand Tools, GM Corp., Detroit Mich. 1945.
- Intertec, Small Engines Service Manual, any ed., Intertec Publishing Corp., 1014 Wyandotte Street, Kansas City Missouri, 64101.
- Tecumseh, Mechanics Manual, part number 692147, Tecumseh Products Co., Grafton Wisconsin, 53024, available from Lambert Electric Ltd., 114 Avenue A North, Saskatoon, Sask. S7L 6Y7.
- Tecumseh, Master Parts Manual, Tecumseh Products Co., OR # 693029 Microfiche Master Parts Manual set and # 693634 Microfiche Early Production Parts, available from Lambert Electric.
- Tecumseh, Tecumseh Parts Price List, form # 694549 latest edition microfiche, Tecumseh Products Company, 900 North Street, Grafton Wisconsin, 53024.
- Workmen's Compensation Board, Safety Creed, #557, WCB of Alberta.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPSET

GENERALIZATION: A knowledge and practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>The student will:</p> <ol style="list-style-type: none"> 1. Safe Operation of Tools and Equipment 2. Unsafe Acts and Unsafe Conditions 3. Accident Reports 4. Compensation 5. First Aid 6. Safety Program 	<ul style="list-style-type: none"> - operate safely tools and equipment such as: <ul style="list-style-type: none"> - hand tools - power tools - lifting devices and stands - compressed air equipment - fire extinguishers - discuss the hazards associated with: <ul style="list-style-type: none"> - gasoline and oil - gases from running engines - use correct protective equipment and apparel at all times - explain the purpose and use of accident report forms and report all accidents - explain the function of and benefits available under the Workers' Compensation Act - attend to all minor injuries and practise minor first aid - participate in the prescribed safety program of the lab and/or school system 		

NOTES:

TOPIC 2: REPAIR

IEPSET

GENERALIZATION: To keep an engine running efficiently it is necessary to conduct periodic overhauls so that parts remain within specified operating tolerances.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>The student will:</p> <p>1. Diagnostic Test:</p> <ul style="list-style-type: none">- combustion chamber- ignition system- fuel system <p>2. Engine Overhaul</p> <ul style="list-style-type: none">- parts- ordering	<p>The student will:</p> <ul style="list-style-type: none">- conduct the following tests and compare the results to specifications:<ul style="list-style-type: none">- compression test- cylinder leakage test- use the following testing equipment to determine the condition of the system and the component parts:<ul style="list-style-type: none">- spark tester- coil tester- condenser tester- examine the fuel tank, lines and carburetor for cleanliness- disassemble engine and clean all parts- use micrometer to measure engine components and compare these to specifications- list parts requiring:<ul style="list-style-type: none">- repair- replacement- use necessary order forms or other process to procure replacement parts		

NOTES:

TOPIC 2: REPAIR (continued)

IEPSET

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none">- repairs- assembly- running- painting <p>3. Costing</p>	<ul style="list-style-type: none">- repair combustion cylinder by honing- grind valves and valve seats- sublet crankshaft repairs where necessary- assemble all components according to manufacturers recommended techniques and torque specifications- make all necessary adjustments- test run the engine and make final adjustments so that engine starts easily and runs smoothly- paint the engine and install identification decals- make up estimates for various repairs- calculate actual cost for various repairs		

NOTES:

MODULE FOUR
MECHANICAL SYSTEMS

OBJECTIVES

The objectives of the Mechanical Systems module is to:

1. Provide the student with the opportunity to dismantle and re-assemble various mechanical systems to determine operating principles and their use in achieving an efficient conversion transfer of energy.

LEARNING RESOURCES

- Crouse W.H., Margules M., Worthington R.M., General Power Mechanics, McGraw-Hill Ryerson, 1970.
- Stockel M.W., Automotive Service and Repair, The Goodheart-Willcox Co. 1976.
- Banitz K., Nash F.C., Automotive Technology, McGraw-Hill Ryerson, 1973.
- Reingold, C.B., A Woman's Guide to the Care and Feeding of an Automobile, Stein and Day, 1973
- Billiet W.E., Venk E.A., Automotive Fundamentals, American Technical Society, Chicago, 1969.
- Deere, John, Fundamentals of Service, Bearings and Seals, John Deere Co., Moline Ill., 1974.
- Deere, John, Fundamentals of Service, Belts and Chains, John Deere Co., Moline Ill., 1971.
- Deere, John, Fundamentals of Service, Fuels, Lubricants and Coolants, John Deere Co., Ill., 1974.
- Deere, John, Fundamentals of Service, Power Trains, John Deere Co., Moline Ill., 1974.
- Ellinger, H.E., Automechanics, Prentice-Hall Inc., Englewood Cliffs, New Jersey, 1977.
- Esso, Fuels and Lubricants, Imperial Oil Ltd., Marketing Technical Services, 1978.
- Glenn, H., Automotive Engine Rebuilding and Maintenance, Chilton Book Co., 81 Curlew Dr., Don Mills, Ontario, M3A 2R1.
- McGuffin, M.J., Steckner, T., Automotive Mechanics and Technology, Macmillan Company, 1975.
- Nash, F.C., Automotive Fundamentals, McGraw-Hill Ryerson, 1965.
- Popular Mechanics, Complete Car Repair Manual, Hearst Corporation, 1975.
- *Thiessen, Dales, Davis, Automotive Principles and Service, Prentice-Hall of Canada, 1981
- Workmen's Compensation Board, Safety Creed #557, WCB of Alberta.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPMS

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	The student will: <ul style="list-style-type: none">- operate safely tools and equipment such as:<ul style="list-style-type: none">- hand tools- power tools- lifting devices and stands- compressed air equipment- fire extinguishers		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none">- discuss the hazards associated with:<ul style="list-style-type: none">- gasoline and oil- gases from running engines- use correct protective equipment and apparel at all times		
3. Accident Reports	<ul style="list-style-type: none">- explain the purpose and use of accident report forms and report all accidents		
4. Compensation	<ul style="list-style-type: none">- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	<ul style="list-style-type: none">- attend to all minor injuries and practise minor first aid		
6. Safety Program	<ul style="list-style-type: none">- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 2: POWER TRANSMISSION

IEPMS

GENERALIZATION: Power is transmitted using fluid or mechanical devices.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Power</p> <p>2. Transmission Devices:</p> <p>- clutches</p> <p>- drives</p>	<p>The student will:</p> <ul style="list-style-type: none">- discuss and define the following concepts of power:<ul style="list-style-type: none">- amplification- torque- power- friction- efficiency- mechanical advantage- velocity- discuss the following clutches:<ul style="list-style-type: none">- ratchet- friction- centrifugal- cone- sprag- multiple disc (wet and dry)- fluid- magnetic (direct and indirect)- band- over running- torque converter- discuss the following drives:<ul style="list-style-type: none">- spur gear- helical gear- bevel gear- hypoid gear- worm gear- herringbone gear- planetary gear- roller chains- ball chains- silent chains		

NOTES:

TOPIC 2: POWER TRANSMISSION (continued)

IEPMS

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> - differentials - bearings 	<ul style="list-style-type: none"> - flat belt - "V" belt - cogged belt - round belt - serpentine belt - describe how the following differentials operate: <ul style="list-style-type: none"> - standard differential - limited slip differential - universal joint - constant velocity joint - describe the operation of the differentials under the following conditions: <ul style="list-style-type: none"> - straight ahead - turning right or left - when vehicle stuck - discuss the operation of the following bearings: <ul style="list-style-type: none"> - ball - roller - needle - Torrington - tapered roller - spherical roller - sintered - sleeve - discuss the following as they relate to bearings: <ul style="list-style-type: none"> - friction - non-friction - radial loads - axial loads - combination loads - embedability - conformability - fatigue strength 		

NOTES:

TOPIC 2: POWER TRANSMISSION (continued)

IEPMS

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
3. Lubrication	<ul style="list-style-type: none"> - surface action - corrosion resistance - temperature strength - journal - describe the function of the following oils and greases: <ul style="list-style-type: none"> - engine oil - transmission oil - differential oil - power steering fluid - general purpose lubricants and greases - special greases - dry lubricants - explain the role of the following organizations concerning lubricants: <ul style="list-style-type: none"> - SAE (Society of Automotive Engineers) - API (American Petroleum Institute) - ASTM (American Society for Testing Materials) - explain the following terms as they relate to lubricants: <ul style="list-style-type: none"> - boundary lubrication - oil additives - synthetic oils - full-flow lubrication - oil filtering system - oil rating 		
4. Seals	<ul style="list-style-type: none"> - differentiate between: <ul style="list-style-type: none"> - static seals and - dynamic seals 		

NOTES:

TOPIC 2: POWER TRANSMISSION (continued)

IEPMS

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
5. Standard Transmission Operation	<ul style="list-style-type: none">- identify and discuss the operation of the following seals:<ul style="list-style-type: none">- paper- cork- treated fibre- neoprene- copper, aluminum, asbestos- RTV sealers- diaphragm- "O" rings- felt- lip- radial lip- labyrinth- piston rings (oil and compression)- water pump- disassemble a transmission- clean all the parts- inspect gears for damage- inspect bearings for wear and damage- trace the path of power flow- calculate the gear ratios in all gears- operate the synchromesh- assemble the transmission- test the operation in all gears		

NOTES:

MODULE FIVE

NON-CONVENTIONAL POWER SOURCES

OBJECTIVES

The objective of the Non-Conventional Power Sources module is to:

1. Make the student more aware of the increasing shortage of conventional energy sources by providing an opportunity to study and experiment with several different power sources to determine their relative efficiency.

LEARNING RESOURCES

Chrysler Canada Ltd., Aries Shop Manual, Chrysler Canada Ltd., 1981.

Delco-Remy, Energizers and Batteries, # 5133B, GM Products of Canada, Oshawa, Ontario.

ESB Brands Inc., Facts About Storage Batteries, E.S.B. Brands Inc., Box 6949, Cleveland, Ohio, 44101.

Halacy, D., Fuel Cells: Power For Tomorrow, The World Publishing Co., Cleveland, Ohio, 1966.

Loper, Ahr, Clendenning, Introduction To Electricity & Electronics, Van Nostrand, Reinhold Ltd., 1410 Birchmount Road, Scarborough, Ontario, 1980.

Schick, K.H., Introduction To Electricity, McGraw-Hill Ryerson, 1975.

Workmen's Compensation Board, Safety Creed, #557, WCB of Alberta.

TOPIC 1: SAFETY

IEPNCP

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Safe Operation of Tools and Equipment	<ul style="list-style-type: none"> - operate safely tools and equipment such as: - electrical devices - hand tools - power tools - lifting devices and stands - compressed air equipment - fire extinguishers 		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none"> - discuss the hazards associated with: - electricity - acids - use correct protective equipment and apparel at all times 		
3. Accident Reports	<ul style="list-style-type: none"> - explain the purpose and use of accident report forms and report all accidents 		
4. Compensation	<ul style="list-style-type: none"> - explain the function of and benefits available under the Workers' Compensation Act 		
5. First Aid	<ul style="list-style-type: none"> - attend to all minor injuries and practise minor first aid with particular attention to electrocution victims 		
6. Safety Program	<ul style="list-style-type: none"> - participate in the prescribed safety program of the lab and/or school system 		

NOTES:

TOPIC 2: ELECTRICITY AND ELECTRIC MOTORS

IEPNCP

GENERALIZATION: Electricity is a form of energy which is commonly converted to mechanical energy and utilized to do work.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Magnetism and Electricity	<p>The student will:</p> <ul style="list-style-type: none">- discuss terminology associated with magnetism, such as:<ul style="list-style-type: none">- lines of force- magnetic poles- magnetic field- permeability- attraction- repulsion- shielding- electromagnetism- solenoid- transformer action- discuss the laws of magnets and magnetism- explain the process of induction:<ul style="list-style-type: none">- mutual- self- describe the practical applications of magnetism- discuss the electrical nature of matter in terms of:<ul style="list-style-type: none">- the electron theory- static electricity- current electricity- electromotive force or potential- electrical power- capacitance- electrical circuits		

NOTES:

TOPIC 2: ELECTRICITY AND ELECTRIC MOTORS (continued)

IEPNCP

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Components	<ul style="list-style-type: none"> - identify and describe the uses of the following components: <ul style="list-style-type: none"> - conductors - insulators - resistors - semi-conductors - transistors - electrical transducer 		
3. Measurement	<ul style="list-style-type: none"> - identify and discuss how to use the following meters: <ul style="list-style-type: none"> - voltmeter - ammeter - ohmmeter - multimeter - use the appropriate meters to measure voltage, current and resistance in the following circuits: <ul style="list-style-type: none"> - series - parallel - series-parallel 		
4. Electric Motor	<ul style="list-style-type: none"> - describe the operation of an electric motor and discuss how it is utilized as a power source in: <ul style="list-style-type: none"> - mass transit - the automobile - calculate the power produced by an electric motor 		

NOTES:

TOPIC 3: OTHER ENERGY SOURCES

IEPNCP

GENERALIZATION: Many extraordinary sources of energy can be utilized to do work.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Chemical Energy	<p>The student will:</p> <ul style="list-style-type: none">- describe the lead-acid storage battery- discuss the use of the battery as an energy source- discuss maintenance of the lead-acid battery		
2. Solar Energy	<ul style="list-style-type: none">- describe the action of the photo electric cell- measure the voltage of a photo electric cell when light is allowed to strike the cell- discuss the use of solar heat collectors		
3. Heat Energy	<ul style="list-style-type: none">- describe the operation of the thermocouple or thermopile- measure voltage on a thermocouple or thermopile as heat is applied to the unit		
4. Mechanical Energy	<ul style="list-style-type: none">- discuss the operation and use of wind chargers- describe how the wind charger is utilized		

NOTES:

MODULE SIX
ELECTRICAL AND ELECTRONIC SYSTEMS

OBJECTIVES

The objective of the Electrical and Electronic Systems module is to:

1. Use electrical and electronic sub-systems taken from the internal combustion engine to help students learn about efficient energy conversion, transfer and utilization.

LEARNING RESOURCES

Crouse, W.H., Automotive Mechanics, McGraw-Hill Ryerson, 1980

Briggs & Stratton, Four Stroke Cycle, # MS 4602-24,
Briggs & Stratton Corp.

Briggs & Stratton, General Theories of Operation, # MS 3553-24,
Briggs & Stratton Corp.

Ford, Charging System, Alternator, # 3101-010, Ford Motor Company,
1980.

Graham, K.C., Understanding & Servicing Fractional Horsepower Motors,
American Technical Society, Chicago, 1967.

Loper, Ahr, Clendenning, Introduction To Electricity & Electronics,
Van Nostrand, Reinhold Ltd., 1410 Birchmount Road, Scarborough,
Ontario, 1980.

Schick, K.H., Introduction To Electricity, McGraw-Hill Ryerson, 1975.

Schweitzer, G., Basics of Fractional Horsepower Motors and Repair,
John F. Rider Publishers, 1978.

*Thiessen, Dales, Davis, Automotive Principles and Service,
Prentice-Hall of Canada, 1981

Workmen's Compensation Board, Safety Creed, #557, WCB of Alberta.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPEES

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Safe Operation of Tools and Equipment	<ul style="list-style-type: none">- operate safely tools and equipment such as:<ul style="list-style-type: none">- electrical devices- hand tools- power tools- lifting devices and stands- compressed air equipment- fire extinguishers		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none">- discuss the hazards associated with:<ul style="list-style-type: none">- electricity- use correct protective equipment and apparel at all times		
3. Accident Report	<ul style="list-style-type: none">- explain the purpose and use of accident report forms and report all accidents		
4. Compensation	<ul style="list-style-type: none">- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	<ul style="list-style-type: none">- attend to all minor injuries and practise minor first aid with particular attention to electrocution victims		
6. Safety Program	<ul style="list-style-type: none">- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 2: ELECTRICAL DEVICES IN AUTOMOTIVES

IEPEES

GENERALIZATION: Electronic and electrical devices are used extensively in automobiles to control and operate systems.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Magnetism and Electricity	<ul style="list-style-type: none">- discuss common terminology and concepts related to magnetism and electricity- discuss the commercial distribution of electricity		
2. Generators	<ul style="list-style-type: none">- identify and discuss the following generators:<ul style="list-style-type: none">- DC car- alternator		
3. Regulators	<ul style="list-style-type: none">- discuss the mechanical regulator in terms of:<ul style="list-style-type: none">- cut out- voltage control- current control- describe the operation of the alternator mechanical regulator- describe the operation of the electronic voltage regulator		
4. Motors	<ul style="list-style-type: none">- discuss the operation and reverse the operation of the following motors:<ul style="list-style-type: none">- series motor- shunt motor- compound motor- shaded pole motor- split phase motor- repulsion-induction motor- three phase motor		

NOTES:

TOPIC 2: ELECTRICAL DEVICES IN AUTOMOTIVES (continued)

IEPEES

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
5. Measurement	<ul style="list-style-type: none">- design and build one of the following:<ul style="list-style-type: none">- battery charger- stator growler- soldering transformer- identify and discuss the use of the following meters:<ul style="list-style-type: none">- voltmeter- ammeter- ohmmeter- multimeter- use the above meters to measure voltage, current and resistance in a variety of circuits		

NOTES:

MODULE SEVEN

ELECTRO MECHANICAL AND ELECTRONIC CONTROL

OBJECTIVES

The objectives of the Electro-Mechanical and Electronic Control module are to:

1. Familiarize the student with some of the electro-mechanical and electronic systems and various combinations.
2. Give the student the opportunity to study various ways to efficiently convert electrical energy to a mechanical or fluid means of controlling and transforming energy, for practical purposes.

LEARNING RESOURCES

Crouse, W.H., Automotive Mechanics, McGraw-Hill Ryerson, 1980.

Anderson, E.P., Home Appliance Repairs, Theodore Audel & Co., 1975.

Calgary Power, Power For Progress, Thermal & Hydro Plants, Calgary Power Co. Box 1900 Calgary Alta. T2P 2M1.

Calgary Power, The Shocking Truth, Calgary Power Co., 1981.

Deere, John, Fundamentals of Service, Electrical Systems, John Deere & Company, Moline, Ill. 1972.

Kogan, P., Pick, J., The Silent Energy, Ginn & Company, Boston, Mass.

Loper, Ahr, Clendenning, Introduction To Electricity & Electronics, Van Nostrand, Reinhold Ltd., 1980.

Motor, Vacuum & Wiring Diagrams, 1979-1980, Motor, 1790 Broadway, New York, 10019.

Rosenberg, Robert, Electric Motor Repair, Holt, Reinhart & Winston Inc.

*Thiessen, Dales, Davis, Automotive Principles and Service, Prentice-Hall of Canada, 1981

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPEEC

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	<p>The student will:</p> <ul style="list-style-type: none">- operate safely tools and equipment such as:<ul style="list-style-type: none">- hand tools- power tools- lifting devices and stands- compressed air equipment- fire extinguishers		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none">- discuss the hazards associated with:<ul style="list-style-type: none">- electricity- use correct protective equipment and apparel at all times		
3. Accident Report	<ul style="list-style-type: none">- explain the purpose and use of accident report forms and report all accidents		
4. Compensation	<ul style="list-style-type: none">- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	<ul style="list-style-type: none">- attend to all minor injuries and practise minor first aid with particular attention to electrocution victims		
6. Safety Program	<ul style="list-style-type: none">- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 2: ELECTRONIC CIRCUITRY

IEPEEC

GENERALIZATION: Electronic controls provide accurate, fast and reliable operation of appliances.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Schematics	<p>The student will:</p> <ul style="list-style-type: none">- read and interpret symbols and schematic diagrams- use schematics to construct circuits in:<ul style="list-style-type: none">- series- parallel- series-parallel- use meters to measure voltage, current and resistance in the circuits		
2. Components	<ul style="list-style-type: none">- describe the operation of:<ul style="list-style-type: none">- relay- solenoid- cut-out- voltage control- current control- electronic voltage regulator- electric transducers- test and observe the operation of:<ul style="list-style-type: none">- relay- solenoid- electronic voltage regulator		
3. Ignition: <ul style="list-style-type: none">- points	<ul style="list-style-type: none">- given an operating point ignition system:<ul style="list-style-type: none">- test dwell- timing- firing order- observe operation		

NOTES:

TOPIC 2: ELECTRONIC CIRCUITRY (continued)

IEPEEC

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none">- electronic- computer control <p>4. Appliances</p>	<ul style="list-style-type: none">- discuss the function of the electronic control module- discuss the function of the sensors as used with the computer engine control system- describe the test procedures for computer controlling devices- describe the operation of various electrical appliances, such as:<ul style="list-style-type: none">- timer switches- valves- heaters- temperature sensors- humidity sensors- smoke sensors		

NOTES:

MODULE EIGHT

APPLIANCE REPAIR AND TROUBLESHOOTING

OBJECTIVES

The objectives of the Appliance Repair and Trouble Shooting module are to:

1. Provide the student with the opportunity to develop logical trouble shooting techniques.
2. Provide the student with experiences in repairing typical appliance faults.

LEARNING RESOURCES

- Anderson, E.P., Home Appliance Repairs, Theodore Audel & Co., Division of Howard W. Sams & Co., 1975.
- Calgary Power, The Shocking Truth, Calgary Power Co., 1981.
- Darr, Jack, Fix Your Small Appliances, Vol. 2, Howard W. Sams & Co., 1974.
- Darr, Jack, How To Repair Small Appliances, Vol. 1, Howard W. Sams & Co., 1971.
- Darr, Jack, How To Repair Small Appliances, Vol. 2, Howard W. Sams & Co., 1971.
- Newnham, R.W., Small Appliance Repairs, McGraw-Hill Ryerson, 1976.
- Schultz, Mort, Complete Appliance Repair Manual, Heart Corp., Popular Mechanics, 1975.
- Stockel, M.W., Auto Service & Repair, Goodheart-Willcox, 1978.
- Wheeler, H.J. How To Repair Electrical Appliances, Reston Publishing Co., 1972.
- Whirlpool Corp., Automatic Dryers, Gas & Electric, Whirlpool Corp., 1979. Part # 603330.
- Whirlpool Corp., Automatic Washers, Operation, Diagnosis, Servicing, Whirlpool Corp., 1978, Part # 603271R.
- Whirlpool Corp., Basic Electricity for Appliances, Whirlpool Corp., 1978.
- Whirlpool Corp., Range Service, Electric, Gas & Microwave Ovens, Whirlpool Corp., 1977. Part #603271R.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPART

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	The student will:		
1. Safe Operation of Tools and Equipment	<ul style="list-style-type: none">- operate safely tools and equipment such as:<ul style="list-style-type: none">- electrical devices- hand tools- power tools- lifting devices and stands- compressed air equipment- fire extinguishers		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none">- discuss the hazards associated with:<ul style="list-style-type: none">- electricity- use correct protective equipment and apparel at all times		
3. Accident Report	<ul style="list-style-type: none">- explain the purpose and use of accident report forms and report all accidents		
4. Compensation	<ul style="list-style-type: none">- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	<ul style="list-style-type: none">- attend to all minor injuries and practise minor first aid with particular attention to electrocution victims		
6. Safety Program	<ul style="list-style-type: none">- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 2: ELECTRICAL APPLIANCES

IEPART

GENERALIZATION: Through the use of electrical appliances work tasks can be handled much more efficiently.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Schematics	The student will: <ul style="list-style-type: none">- read and interpret symbols and schematic wiring diagrams		
2. Appliance Operation	<ul style="list-style-type: none">- discuss the operation and control of appliances such as:<ul style="list-style-type: none">- flat iron- toaster- food mixer- curling iron- hair dryer- vacuum cleaner- shaver- skillet- electric motor- transformer- generator- electric fence- battery charger- car heater- lamp- other automobile accessories		
3. Diagnosis	<ul style="list-style-type: none">- use the following testing devices to diagnose problems in circuits and electronic components:<ul style="list-style-type: none">- ammeter- voltmeter- ohmmeter- oscilloscope		

NOTES:

TOPIC 2: ELECTRICAL APPLIANCES

IEPART

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Testing	<ul style="list-style-type: none">- use the appropriate device to test:<ul style="list-style-type: none">- switches- circuit breakers- temperature sensors- humidity sensors- smoke sensors- diodes- transistors- windings- armatures- heating elements- field coils		
5. Repair	<ul style="list-style-type: none">- connect and solder wires- connect and terminate wires using non solder devices- use appropriate manuals, tools and equipment and systematic trouble-shooting, when repairing problems in appliances such as:<ul style="list-style-type: none">- irons- toaster- food mixer- dryers- vacuum cleaner- shaver- electric motors- heater- battery charger- other automobile equipment		

NOTES:

MODULE NINE
AUTOMOBILE MAINTENANCE

OBJECTIVES

The objectives of the Automobile Maintenance module are to:

1. Give the student the opportunity to study the various systems and sub-systems that make up an automobile.
2. Give the student the opportunity to learn how to take preventive care of a car.

LEARNING RESOURCES

- *Crouse, W.H. Automotive Mechanics, McGraw-Hill Ryerson, 1980.
Stockel, W.M., Auto Service & Repair, Goodheart-Willcox, 1978.
ACCESS, Series #2161, Car Owner's Maintenance Guide, 13 Video Tapes, ACCESS Alberta, 1980.
Car Manufacturers, Operation & Service Manuals, Chrysler, Ford, GM.
Chilton, Easy Car Care, Chilton Book co., 81 Curlew Dr., Don Mills Ont., MEA 2R1, 1980.
Consumers Guide, Complete Guide to Auto Repair, Modern Promotions, a Division of Unisystems Inc., New York, 10022, 1981.
Ford, Service Training Aids Catalogue, Ford Service Publications, Box 07150, Detroit, Michigan, 48207.
General Motors Corp., ABC's of Hand Tools, GM Corp., Detroit Mich., 1945.
Mechanics Illustrated, Car Care, Arco Publishing Co., 219 Park Avenue South, New York, 10003, 1971.
Remling, John, Basics, John Wiley & Sons Inc. 1981.
Stahn, C.R., Automotive Construction & Operation, McGraw-Hill Ryerson, 1976.
Texaco Canada Ltd., Car Care Guide, Check Chart, a Division of H.M. Gousha Co., Texaco Canada Ltd., 1981.
*Thiessen, Dales, Davis, Automotive Principles and Service, Prentice-Hall of Canada, 1981
Readers Digest of Canada, Complete Car Care Manual
ACCESS, A Car Owners Maintenance Guide

*Refers to prescribed resources

TOPIC 1: SAFETY

IEPAM

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	<p>The student will:</p> <ul style="list-style-type: none"> - operate safely tools and equipment such as: - hand tools - power tools - lifting devices and stands - compressed air equipment - fire extinguishers 		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none"> - discuss the hazards associated with: - gasoline, oil and other fluids - gases from running engines - use correct protective equipment and apparel at all times 		
3. Accident Report	<ul style="list-style-type: none"> - explain the purpose and use of accident report forms and report all accidents 		
4. Compensation	<ul style="list-style-type: none"> - explain the function of and benefits available under the Workers' Compensation Act 		
5. First Aid	<ul style="list-style-type: none"> - attend to all minor injuries and practise minor first aid 		
6. Safety Program	<ul style="list-style-type: none"> - participate in the prescribed safety program of the lab and/or school system 		

NOTES:

TOPIC 2: REGULAR MAINTENANCE

IEPAM

GENERALIZATION: Regular maintenance of a vehicle will prolong the life of the paint, reduce corrosion, extend the life of the motor and enhance the resale value of the vehicle.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>1. Exterior/ Interior</p> <p>2. Engine Lubrication:</p> <p>- oil</p> <p>- grease</p>	<p>The student will:</p> <ul style="list-style-type: none">- thoroughly wash the exterior of a vehicle- vacuum the interior of a vehicle- discuss the types of polish available and use an appropriate polish on a vehicle- determine the oil change interval for a specific vehicle and discuss:<ul style="list-style-type: none">- API ratings- SAE ratings- oil brand variations in quality and cost- types of filters- change engine oil and filter- check oil level in a differential and inspect for contamination- discuss the types of grease available and the equipment used in the application of grease- choose an appropriate lubricant and lubricate the chassis		

NOTES:

TOPIC 2: REGULAR MAINTENANCE (continued)

IEPAM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none"> - fluid - other <p>3. Systems:</p> <ul style="list-style-type: none"> - cooling - battery - brakes - power steering - windshield washer 	<ul style="list-style-type: none"> - determine the type of lubricant and repack the wheel bearings - discuss the transmission fluids available and inspect and replenish the fluid in a transmission (standard and automatic) - check weather strip and use appropriate lubrication on rubber weather strip - check antifreeze strength, level, and system for leaks or evidence of rust - flush system, if necessary, and replace antifreeze - inspect battery electrolyte level and test specific gravity - check brake fluid level and system for leaks and add fluid if required - check power steering fluid level and system for leaks and fill according to manufacturers recommendations - check fluid level in windshield washer system and fill with recommended fluid 		

NOTES:

TOPIC 2: REGULAR MAINTENANCE (continued)

IEPAM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Tires: <ul style="list-style-type: none">- construction- pressure- balancing- rotation- wear patterns	<ul style="list-style-type: none">- discuss tire construction, load range and thread design and identify:<ul style="list-style-type: none">- bias ply- belted ply- radial- identify manufacturers recommended tire pressures and check tire pressures- discuss the need for balancing and balance wheels with both static and dynamic balancers- discuss rotation according to construction types and rotate a set of wheels- discuss and diagnose vehicle problems according to tire wear characteristics		
5. Lights	<ul style="list-style-type: none">- inspect all lights for proper operation- replace bulbs as required- aim headlights according to manufacturers recommendations- repair wiring or connections as required- replace blown fuses and test operation of the circuit- test and replace switches as required		

NOTES:

TOPIC 2: REGULAR MAINTENANCE (continued)

IEPAM

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
6. Others	<ul style="list-style-type: none">- inspect, repair or replace if necessary:- wiper blades- exhaust system for leaks- cracked, worn or glazed belts (adjust tension)- hoses- shock absorber action and leaks- mirrors- fluid leaks- radiator cap operation- PCV valve operation- air cleaner filter element- charcoal canister filter element		

NOTES:

MODULE TEN

FLUID POWER

OBJECTIVES

The objectives of the Fluid Power module are to:

1. Give the student an opportunity to assemble, operate and analyze several different hydraulic systems to determine the efficiency of conversion transfer and utilization of energy.
2. Allow the student the opportunity to analyze several pneumatic systems.

LEARNING RESOURCES

- *Crouse, W.H. Automotive Mechanics, McGraw-Hill Ryerson, 1980.
- Stockel, W.M., Auto Service & Repair, Goodheart-Willcox, 1978.
- Althouse, A.D., Modern Refrigeration & Air Conditioning, Goodheart-Willcox, 1975.
- Car Manufacturers, Operation & Service Manuals, Chrysler, Ford, GM.
- Deere, John, Fundamentals of Service, Air Conditioning, John Deere Corp., Moline Ill. 1973.
- Dwiggins, Boyce H., Automotive Air Conditioning, Delmar Publishers Co.
- Ford, Service Training Aids Catalogue, Ford Service Publications, Box 07150, Detroit, Mich, 48207.
- General Motors Corp., ABC's of Hand Tools, GM Corp., Detroit Mich., 1945.
- Motor, Auto Trouble Shooter, Motor, Hearst Corp., 1981.
- *Thiessen, Dales, Davis, Automotive Principles and Service, Prentice-Hall of Canada, 1981
- Whirlpool Corp., Part 1, Refrigeration Service, Whirlpool Corp., 1979.
- Whirlpool Corp., Part 2, Refrigeration Service, Whirlpool corp., 1974, part #603331.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPFP

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>The student will:</p> <p>1. Safe Operation of Tools and Equipment</p> <p>2. Unsafe Acts and Unsafe Conditions</p> <p>3. Accident Report</p> <p>4. Compensation</p> <p>5. First Aid</p> <p>6. Safety Program</p>	<p>- operate safely tools and equipment such as:</p> <ul style="list-style-type: none"> - hand tools - power tools - lifting devices and stands - compressed air equipment - fire extinguishers <p>- discuss the hazards associated with:</p> <ul style="list-style-type: none"> - fluid under pressure - gasoline and oil - gases from running engines - RIZ refrigerant <p>- use correct protective equipment and apparel at all times</p> <p>- explain the purpose and use of accident report forms and report all accidents</p> <p>- explain the function of and benefits available under the Workers' Compensation Act</p> <p>- attend to all minor injuries and practise minor first aid</p> <p>- participate in the prescribed safety program of the lab and/or school system</p>		

NOTES:

TOPIC 2: HYDRAULIC FLUID DEVICES

IEFPF

GENERALIZATION: Hydraulic and fluidic principles are used to control equipment and devices in automobiles.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Pascal's Law	The student will: <ul style="list-style-type: none">- discuss Pascal's Law and the relationship of force, pressure and area		
2. Hydraulic Jack	<ul style="list-style-type: none">- dismantle a hydraulic jack and identify:<ul style="list-style-type: none">- pump- ram- release- check valves- reservoir- inspect all components for damage or wear- determine the principles of operation- repair and assemble the jack- test the jack for operation- paint the repaired jack		
3. Hydraulic Brakes	<ul style="list-style-type: none">- discuss the principle of operation of the hydraulic brake system- identify the following components:<ul style="list-style-type: none">- master cylinder- wheel cylinder- pressure differential valve- proportioning valve- inspect a master cylinder and describe its operation		

TOPIC 2: HYDRAULIC FLUID DEVICES (continued)

IEPFP

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Power Steering	<ul style="list-style-type: none"> - inspect wheel cylinders for drum and disc operation - service, clean and repair brake systems: <ul style="list-style-type: none"> - power brakes - drum brakes - disc brakes - identify the following power steering components: <ul style="list-style-type: none"> - pressure pump - pressure regulator - ram or cylinder - control valve - dismantle, inspect and describe the operation of the following: <ul style="list-style-type: none"> - pump - control valve - ram - correctly assemble all the components 		
5. Automatic Transmission	<ul style="list-style-type: none"> - discuss the principle of operation of the automatic transmission - identify and discuss the operation of the following components: <ul style="list-style-type: none"> - torque converter - front pump - pressure regulator valve - manual valve - throttle valve - governor valve - accumulator - servo - clutches - bands - sprags - modulator 		

TOPIC 3: PNEUMATIC POWERED DEVICES

IEFPF

GENERALIZATION: Pascal's law, Charles' law and Boyle's law are applied in the principles of operation of pneumatic powered components.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Laws	The student will: <ul style="list-style-type: none">- discuss the following laws and their application in the pneumatics area:<ul style="list-style-type: none">- Pascal's law- Charles' law- Boyle's law		
2. Pneumatic Devices	<ul style="list-style-type: none">- discuss the principle of operation of the following devices:<ul style="list-style-type: none">- compressors<ul style="list-style-type: none">- piston- centrifugal- turbine- turbocharger- air pressure regulator- oiler- air tools<ul style="list-style-type: none">- wrenches- sanders- chisels- screw drivers- drills		
3. Air Conditioning <ul style="list-style-type: none">- theory	<ul style="list-style-type: none">- discuss the principle of operation of the following air conditioning components:<ul style="list-style-type: none">- compressor- expansion valve- evaporator- receiver dryer- accumulator- condenser		

NOTES:

TOPIC 3: PNEUMATIC POWERED DEVICES (continued)

IEPFP

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>- practical</p> <p>4. Pollution Control</p>	<ul style="list-style-type: none"> - controls <ul style="list-style-type: none"> - suction throttling valve - pressure switches - blend-air door - connect manifold gauges according to manufacturers recommendations - read pressures on the high and low side of the compressor - interpret readings in relation to ambient air temperature - discharge the refrigerant according to manufacturers recommendations - evacuate the system - charge the air conditioner with refrigerant - test the system for leaks using an electronic leak detector - identify, discuss the operation and test the various amplification sensors, controls and valves used in many automotive pollution control devices: <ul style="list-style-type: none"> - vacuum amplifiers - vacuum transducers - manifold absolute pressure sensor - barometric pressure sensor - exhaust gas recirculation valve position sensor 		

NOTES:

TOPIC 3: PNEUMATIC POWERED DEVICES (continued)

IEFPF

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none">- controls<ul style="list-style-type: none">- distributor vacuum advance- carburetor dash pot- coolant controlled exhaust gas recirculation valve- spark advance control- thermostatically controlled air cleaner- thermal vacuum switch- valves<ul style="list-style-type: none">- exhaust aspirator- exhaust gas recirculation- heater water valves- canister purge solenoid- positive crankcase ventilator- spark delay- thermactor air diverter- throttle kicker solenoid		

NOTES:

MODULE ELEVEN
AUTOMOBILE TUNE-UP

OBJECTIVES

The objectives of the Automobile Tune-up module are to:

1. Make the student aware of the various functions of the different sub-systems of an engine.
2. Make the student aware of how the sub-systems can be adjusted to produce more efficient conversion, transfer and utilization of energy.

LEARNING RESOURCES

*Crouse, W.H., Automotive Mechanics, McGraw-Hill Ryerson, 1980.

Car Manufacturer, Operation and Service Manuals, Chrysler, Ford, General Motors.

Ford, Service Aids Training Catalogue, Ford Service Publications, Box 07150, Detroit Mich. 48207.

General Motors Corp., ABC's of Hand Tools, GM Corp., Detroit Mich. 1945.

Ignition Manufacturers Institute, Automotive Emission Control and Tune-Up Procedures, Prentice-Hall of Canada, Toronto, 1980.

Motor, Auto Trouble Shooter, Hearst Corp., 1973.

Motor, Emission Control Manual, #1, Hearst Corp., 1973.

Motor, Emission Control Manual, #2, Hearst Corp., 1975.

Sun Electric Corp., Suntester Bulletins #218 to #281, Sun Electric Corp., Dept. 4099, One Sun Parkway, Crystal Lake, Illinois, 60014.

*Thiessen, Dales, Davis, Automotive Principles and Service, Prentice-Hall of Canada, 1981

Workmen's Compensation Board, Safety Creed # 557, WCB of Alberta.

Periodicals

Canadian Automotive Trade, 1981, Maclean-Hunter Ltd., Contact
Laura Arffa, Edmonton, Alberta, Ph. 428-6886.

Motor, Hearst Corp., 1981.

Flip Charts

Delco-Remy, Energizers and Batteries, #5133B, General Motors
Products of Canada, Oshawa, Ontario

Delco-Remy, Delcotron Generator & the Charging Circuit, (I-D Series)
#5133M, GM of Canada.

Delco-Remy, Integral Charging System, #5133S, GM of Canada.

Delco-Remy, Transistor Regulators, #5133L, GM of Canada.

Delco-Remy, The Ignition System, #5133D, GM of Canada.

Delco-Remy, High Energy Ignition System, #5133H, GM of Canada.

*Refers to prescribed resources

TOPIC 1: SAFETY

IEPAT

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	The student will: <ul style="list-style-type: none">- operate safely tools and equipment such as:<ul style="list-style-type: none">- hand tools- power tools- lifting devices and stands- compressed air equipment- fire extinguishers- electrical devices		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none">- discuss the hazards associated with:<ul style="list-style-type: none">- electricity- use correct protective equipment and apparel at all times		
3. Accident Report	<ul style="list-style-type: none">- explain the purpose and use of accident report forms and report all accidents		
4. Compensation	<ul style="list-style-type: none">- explain the function of and benefits available under the Workers' Compensation Act		
5. First Aid	<ul style="list-style-type: none">- attend to all minor injuries and practise minor first aid		
6. Safety Program	<ul style="list-style-type: none">- participate in the prescribed safety program of the lab and/or school system		

NOTES:

TOPIC 2: TUNE-UP

IEPAT

GENERALIZATION: Frequent tune-up will help identify problems before they become major and keep the automobile operating cleanly and efficiently.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Diagnosis	<p>The student will:</p> <ul style="list-style-type: none"> - perform a compression (wet and dry) and a cylinder leakage test to determine the condition of the engine - use a timing light to help diagnose problems with: <ul style="list-style-type: none"> - camshaft gears - belt or chain - use a pressure gauge to diagnose problems with engine lubrication system 		
2. Inspections	<ul style="list-style-type: none"> - inspect the cooling system for: <ul style="list-style-type: none"> - rust - dirt and debris plugging radiator - belt wear and tension - inspect the battery fluid and clean the posts and cables 		
3. Tests	<ul style="list-style-type: none"> - use the appropriate equipment to test the following: <ul style="list-style-type: none"> - pollution control devices - pressure test cooling system - battery - starting system - wiring systems for poor connections - fuel supply system 		

NOTES:

TOPIC 2: TUNE-UP (continued)

IEPAT

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Pollution	<ul style="list-style-type: none"> - discuss pollution conditions in cities and determine how the automobile forms: <ul style="list-style-type: none"> - hydrocarbons - carbon monoxide - oxides of nitrogen 		
5. Ignition System	<ul style="list-style-type: none"> - analyse the ignition system and test: <ul style="list-style-type: none"> - ignition coil - condenser - point spring tension - ballast register - mechanical advance - vacuum advance - inspect the following: <ul style="list-style-type: none"> - points condition - distributor cap and rotor - spark plug wires and boots - adjust ignition point dwell and ignition timing - test and replace if necessary: <ul style="list-style-type: none"> - distributor pick-up coil - electronic ignition control module 		
6. Fuel System	<ul style="list-style-type: none"> - discuss the operation of the components of the fuel system: <ul style="list-style-type: none"> - fuel tank - fuel lines - fuel valves - fuel filter - test and repair/replace a fuel pump 		

NOTES:

TOPIC 2: TUNE-UP (continued)

IEPAT

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
7. Engine Control and Anti-Pollution Devices	<ul style="list-style-type: none"> - discuss the following in relation to the carburetor: <ul style="list-style-type: none"> - venturi - main circuit - idle circuit - accelerator circuit - power circuit - secondary circuit - variable venturi carb. - locate all adjustment and procedure specifications for a carburetor and clean and adjust a carburetor - use propane assistance to set idle fuel mixture and speed - service all filters - identify and test the following: <ul style="list-style-type: none"> - vacuum transducer - manifold absolute pressure sensor - barometric pressure sensor - exhaust gas recirculation valve position sensor - crankshaft position sensor - coolant temperature sensors - ambient temperature sensor - oxygen sensor - throttle position sensor - speed sensor - detonation sensor - vacuum amplifier - exhaust gas recirculation valve - exhaust aspirator valve - canister purge solenoid 		

NOTES:

TOPIC 2: TUNE-UP (continued)

IEPAT

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
8. Advanced Tune-up	<ul style="list-style-type: none">- positive crankcase ventilation valve- spark delay valve- thermactor air diverter valve- throttle kicker solenoid valve- engine control computer- spark advance control- temperature ignition control- heated air cleaner controls- coolant controlled exhaust gas recirculation- early fuel evaporation system- charcoal canister- other <ul style="list-style-type: none">- discuss, diagnose and check for accuracy of diagnosis when repairs have been completed for the following conditions:<ul style="list-style-type: none">- ping or detonation- starting problems- missing at high speeds- rough idle- hesitation on acceleration- dieselling or run-on- heavy fuel consumption- engine overheating- lack of power or performance- charging system problems- engine knock- exhaust system restrictions- improperly functioning valve train- catalytic converter problems		

NOTES:

MODULE TWELVE
AUTOMOBILE REPAIR

OBJECTIVES

The objective of the Automobile Repair module is to:

1. Make the student aware of the diagnostic procedures for the repair or replacement of parts in order to keep an automobile operating efficiently.

LEARNING RESOURCES

*Crouse, W.H., Automotive Mechanics, McGraw-Hill Ryerson, 1980.

Barkhouse, Bob, Engine Repair - Head Assembly & Valve Gear, McKnight Publishing Co., 1979.

Car Manufacturer, Operation and Service Manuals, Chrysler, Ford General Motors.

Chilton, Auto Body Repair, Chilton Book Co., 81 Curlew Drive, Don Mills, Ontario, M3A 2R1, 1981.

Chilton, Minor Auto Body Repair, Chilton Book Co., 1981.

Ford, Service Training Aids Catalogue, Ford Service Publications, Box 07150, Detroit, Mich. 48207.

General Motors Corp., ABC's of Hand Tools, GM Corp., Detroit, Mich. 1945.

Motor, Auto Trouble Shooter, Hearst Corp., 1981.

Nash, Automotive Fundamentals, McGraw-Hill Ryerson, 1981.

Remling, John, Basics, John Wiley & Sons, 1981.

*Thiessen, Dales, Davis, Automotive Principles and Service, Prentice-Hall of Canada, 1981

Venk, E., Spicer, E., Davies, E.J., Automotive Collision Work, American Technical Society, 1969.

Workmen's Compensation Board, Safety Creed #557, WCB of Alberta.

*Refers to prescribed resources.

TOPIC 1: SAFETY

IEPAR

GENERALIZATION: The practice of safety is essential in all laboratory activities.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Safe Operation of Tools and Equipment	<p>The student will:</p> <ul style="list-style-type: none"> - operate safely tools and equipment such as: <ul style="list-style-type: none"> - hand tools - power tools - lifting devices and stands - compressed air equipment - fire extinguishers - electrical devices 		
2. Unsafe Acts and Unsafe Conditions	<ul style="list-style-type: none"> - discuss the hazards associated with: <ul style="list-style-type: none"> - gasoline, oil and fluids - gases from running engines - spray paints - use correct protective equipment and apparel at all times 		
3. Accident Report	<ul style="list-style-type: none"> - explain the purpose and use of accident report forms and report all accidents 		
4. Compensation	<ul style="list-style-type: none"> - explain the function of and benefits available under the Workers' Compensation Act 		
5. First Aid	<ul style="list-style-type: none"> - attend to all minor injuries and practise minor first aid 		
6. Safety Program	<ul style="list-style-type: none"> - participate in the prescribed safety program of the lab and/or school system 		

NOTES:

TOPIC 2: MAJOR REPAIRS

IEPAR

GENERALIZATION: Various components in the automobile become worn during the operating life of the vehicle and require repair or replacement.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Brakes	<p>The student will:</p> <ul style="list-style-type: none">- determine specifications and standards to be used while repairing brakes- explain how Pascal's law applies to brakes- inspect the master cylinder and describe its operation- repair the master cylinder according to manufacturers recommendations- inspect wheel cylinders and describe their operation- repair wheel cylinders according to manufacturers recommendations- service, clean and repair brake lines- reline brakes according to manufacturers recommendations- sublet machining of brake drums or rotors- use brake fluid meeting SAE; specifications and DOT (department of transport) ratings of 3 or 4		

NOTES:

TOPIC 2: MAJOR REPAIRS (continued)

IEPAR

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
2. Engines	<ul style="list-style-type: none"> - disassemble an engine - clean all engine parts - determine condition of parts by measuring with various micrometers, calipers, etc. - replace worn parts or recondition to factory specifications - sublet major engine machining such as cylinder reboring etc. - determine feasibility of repair - assemble engine - paint assembled engine - install engine in chassis - start and operate engine 		
3. Transmission	<ul style="list-style-type: none"> - study and inspect automatic transmission components such as: <ul style="list-style-type: none"> - planetary gears - torque converter - front pump - pressure regulator valve - manual valve - throttle valve - governor valve - accumulator - servo - clutches - bands - sprags - modulator 		

TOPIC 2: MAJOR REPAIRS (continued)

IEPAR

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
4. Drive Line	<ul style="list-style-type: none"> - test automatic transmission fluid level according to manufacturers recommendations - determine condition of the transmission fluid - change transmission fluid and filter - clean transmission cooler and lines - adjust transmission bands where applicable - mark the position and remove a drive shaft - replace a worn universal joint - replace a worn constant velocity joint - repair a differential by replacing worn components - follow the manufacturers recommendations when adjusting pre-load and gear mesh patterns 		
5. Electrical System	<ul style="list-style-type: none"> - discuss the operation of the following components: <ul style="list-style-type: none"> - battery - generator or alternator - regulator - starter - solenoids - relays 		

NOTES:

TOPIC 2: MAJOR REPAIRS (continued)

IEPAR

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
6. Body Work	<ul style="list-style-type: none">- electric motors<ul style="list-style-type: none">- heater- wiper- power seat- power window- wiring components- test the battery- service the battery- test the charging system- service and repair the charging system- service and repair the starting system- service and repair the electrical system- describe the following in relation to autobody repair:<ul style="list-style-type: none">- procedure for repairing a dent- metal preparation- sanding techniques- materials to use in repair- body fillers- painting primer coating- straighten a dent no larger than 1 000 cm²- use body filler- use hand tools for repair of minor damage		

NOTES:

TOPIC 2: MAJOR REPAIRS (continued)

IEPAR

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
	<ul style="list-style-type: none">- shrink stretched metal- repair stretched metal- repair rust problems less than 1 000 cm²- install body side mouldings- prepare surface for finish paint coat- sublet final painting- adjust hood, trunk lid, doors		

NOTES:

MODULE THIRTEEN
AUTOMOBILE OWNERSHIP

OBJECTIVES

The objectives of the Auto Ownership module are to:

1. Provide the student with the opportunity to develop a procedure for inspecting and purchasing an automobile.
2. Provide the student the opportunity to discover the social and legal responsibilities of automobile ownership.

LEARNING RESOURCES

Alberta Transportation, Personal Vehicle Equipment Requirements, Room 201, Transportation Building, 9630 - 106 St. Edmonton, T5K 2B8.
- Check list for Holiday Trailers, Check list for Motor Homes, check list for Towing Vehicles, check list for Trailers, check list for Truck Campers.

Car Manufacturer, Operation and Service Manuals, Chrysler, Ford, General Motors.

Ford, Service Training Aids Catalogue, Ford Service Publications, Box 07150, Detroit, Michigan, 48207.

Jackson, Charles, R., How To Buy a Used Car, Chilton Book Co., Radnor, Pennsylvania, 1974.

Stahn, C.R., Automotive Construction and Operation, McGraw-Hill Ryerson, 1976.

Vajda, S.J., Your Car, McGraw-Hill Ryerson, 1976.

Readers Digest of Canada, Complete Car Care Manual

TOPIC 1: SAFETY INSPECTION

IEPA0

GENERALIZATION: A responsible automobile owner maintains the vehicle in a safe operating condition.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Routine Inspections	<p>The student will:</p> <ul style="list-style-type: none">- inspect, replace or repair the following systems and components:<ul style="list-style-type: none">- lights and bulbs- wiper blades- brakes- steering- tires- mirrors- glass		

TOPIC 2: OWNER RESPONSIBILITIES

IEPA0

GENERALIZATION: Many responsibilities have to be considered prior to the purchase of an automobile.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Responsibilities <ul style="list-style-type: none">- legal	<p>The student will:</p> <ul style="list-style-type: none">- determine the legal requirements of the automobile operator such as:<ul style="list-style-type: none">- licences- insurance- vehicle condition		

NOTES:

TOPIC 2: OWNER RESPONSIBILITIES (continued)

IEPAO

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<ul style="list-style-type: none">- moral- financial- others	<ul style="list-style-type: none">- discuss the moral considerations of ownership, such as:<ul style="list-style-type: none">- rules and regulations- vehicle condition- alcohol and drug abuse- discuss the financial costs of owning and operating an automobile including:<ul style="list-style-type: none">- purchase price- licence cost- insurance- service- maintenance- discuss the correct procedure and authorities to contact in case of an accident- describe how to search for a lien against an automobile		
2. Insurance Coverage	<ul style="list-style-type: none">- discuss insurance coverage according to the following headings:<ul style="list-style-type: none">- mandatory coverage- desirable coverage- conditions determining rates- protection benefits- accident notification- discuss the following topics in relation to insurance:<ul style="list-style-type: none">- third party liability- loss or damage to insured vehicle- endorsement		

NOTES:

TOPIC 3: PURCHASING AN AUTOMOBILE

IEPAO

GENERALIZATION: Acquisition of a car involves shopping, negotiating and buying according to the purchasers needs for transportation.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Preparation	<p>The student will:</p> <ul style="list-style-type: none"> - discuss the following topics in preparation for purchasing an automobile: <ul style="list-style-type: none"> - obsolescence - costs of North American vehicles compared to others - parts availability - service availability - durability of different makes and models 		
2. Finances	<ul style="list-style-type: none"> - determine the price range in which the automobile must fit and discuss: <ul style="list-style-type: none"> - financing the purchase - installment buying - interest rates 		
3. Survey	<ul style="list-style-type: none"> - check newspapers and car lots for vehicles which meet established criteria and check: <ul style="list-style-type: none"> - price range for specific make and model - mechanical condition - body condition - additional accessories required to meet needs 		
4. Inspections	<ul style="list-style-type: none"> - check manufacturers specifications for allowable wear and inspect the following: <ul style="list-style-type: none"> - ball joints - tie rod ends - idler arm - shock absorbers 		

TOPIC 3: PURCHASING AN AUTOMOBILE (continued)

IEPAO

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
5. Purchase	<ul style="list-style-type: none">- test the battery using voltmeter, battery hydrometer- inspect the condition of automatic transmission fluid for signs of burnt band or clutch material- discuss how to negotiate price with selling agent- read and discuss sales contract agreements- discuss warranties		

TOPIC 4: OWNER MAINTENANCE AND OPERATION

IEPAO

GENERALIZATION: Efficient operation of a vehicle is dependent on regular servicing and maintenance.

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
1. Automobile Maintenance and Service	<p>The student will:</p> <ul style="list-style-type: none">- locate a maintenance guide for a specific vehicle and determine:<ul style="list-style-type: none">- type of gasoline to be used- weight of oil to be used- tire pressures recommended- service schedule to be observed- inspect the following on a vehicle:<ul style="list-style-type: none">- oil and fluid levels		

TOPIC 4: OWNER MAINTENANCE AND OPERATION (continued)

IEPA0

CONCEPTS/SUBCONCEPTS	LEARNING TASKS	HOURS	REFERENCES
<p>2. Attachments:</p> <ul style="list-style-type: none"> - trailer hitches - trailer towing <p>3. Off Road Vehicles</p>	<ul style="list-style-type: none"> - hoses - belts - brakes - tire pressures and tires - controls for operation of wipers, lights and bulbs <ul style="list-style-type: none"> - determine types of hitches available and discuss: <ul style="list-style-type: none"> - electrical connections - power requirements for loads - rear axle gear ratios - car size versus trailer size - trailer brake application - extra coding requirements - mirrors - discuss the operating characteristics when towing a trailer in: <ul style="list-style-type: none"> - wind - rain - snow - ice - discuss and use a model to practice: <ul style="list-style-type: none"> - back-up procedures - cornering techniques - passing techniques - discuss off road vehicle types, dangers and operating characteristics 		

NOTES:

E. GENERAL

1. Research Module

The purpose of the Research Module is to allow individual students to engage in an in-depth study of a problem related to any of the career fields.

The time period is 25 hours and qualifies as a regular module.

The module provides for individualizing the program to allow for special interests of students. The student should prepare a proposal of his research and have it approved by the teacher. The proposal should contain:

- a) A statement of the problem.
- b) The procedure to be followed in the research of the problem.
- c) A list of the materials and lab facilities to be used.
- d) A time line of activities.

2. Developmental Module

The purpose of the Developmental Module is to provide a 25-hour block of time for the teacher to try out new content with his class. The content of the proposal or project should be discussed with the Associate Director of Curriculum for Industrial Education.

3. Production Service Module

The purpose of Production Service is to provide for a class project in setting up a company to produce a product or service.

The Production Science 30 course will provide an outline from which content may be selected to develop a 25-hour module. The Production Science 30 is a full 4-5 credit course so the teacher must be selective in choosing the content for a 25-hour or one-credit module.

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